CLAIMS

1. An image display apparatus by a projector, the projector being a single polarizer projector comprising an image processing circuit for scaling processing of the image, a γ correction circuit for subjecting a color to γ correction for obtaining a color suiting to the display on the display panel, a panel drive circuit for driving the display panel and a color switch for selecting a color with a specific color tone to be displayed, wherein the color switch drive circuit is designed to determine the mean luminance of the picture element data outputted from the image processing circuit so that the white color or black color can be inserted among the displayed gradations of the R, G and B lights according to the value of the mean luminance to expand the dynamic range for image display.

2. The image display apparatus by a projector defined in claim 1, wherein the panel drive circuit generates the triggers for the R, G and B lights in order to drive the color switch, whereby the color tone display on the display panel and the coloring by the color switch can be synchronized with each other.

3. The image display apparatus by a projector defined in claim 1, wherein the criterion for selecting either the white color or black color is set to the mean luminance of about 50% so that the white color is inserted when the mean luminance is greater than the criterion for selection while the black color is inserted when the mean luminance is smaller than the criterion, thereby contributing to the improvement of the contrast.

4. The image display apparatus by a projector defined in claim 1, wherein the timing for the insertion of the white color or black color is controlled according to the mean luminance, thereby not only improving the purity of the white color or black color but also maintaining the purities of other colors as high as possible.

5. The image display apparatus by a projector defined in claim 1, wherein the color switch drive circuit comprises the RGB/Y conversion circuit for converting the R, G and B signals to the Y signals, the mean luminance calculation circuit for calculating the mean luminance, the white color/black color insertion timing control circuit for generating the white color/black color insertion timing signal, and the D/A conversion circuit for converting the output of the white color/black color insertion timing control circuit to analog output, whereby the triggers for the R, G and B colors are outputted respectively to the white color/black color insertion timing control circuit so that the white color/black color insertion timing control circuit is able to output the color information corresponding to and synchronized with each trigger and matching with the first half of the trigger, while outputting the white color or black color information according to the mean luminance and matching with the latter half of the trigger.

6. The image display apparatus by a projector defined in claim 1, wherein the color switch drive circuit comprises the RGB/Y conversion circuit for converting the RGB signals to the luminance signals, the mean luminance calculation circuit for determining the mean luminance, the white color/black color insertion timing control circuit for generating the white color/black color insertion timing signal, and the D/A conversion circuit for converting the output of the white

color/black color insertion timing control circuit to analog output, whereby each of the triggers for the R, G and B is outputted by the RGB trigger generating means responding to a single trigger outputted from the panel drive circuit; the white color/black color insertion timing control circuit generates the output timing signal for each of the R, G and B colors, according to each of the triggers for the R, G and B so that the white color information or the black color information can be outputted according to the mean luminance.

7. The image display apparatus by a projector defined in claim 5, wherein, in outputting the color information corresponding to the trigger, the voltage output from the D/A conversion circuit is controlled according to the mean luminance to control the transmittance of the color switch, thereby improving the contrast.

8. The image display apparatus by a projector defined in claim 6, wherein, in outputting the color information corresponding to the trigger, the voltage output from the D/A conversion circuit is controlled according to the mean luminance to control the transmittance of the color switch, thereby improving the contrast.

9. The image display apparatus by a projector defined in claim 5 or claim 6, wherein the white color/black color insertion timing control circuit comprises the first counter for counting the pulse width of the trigger signal, the second counter for counting and detecting the assert position of the trigger signal, the ratio calculator for varying the pulse width counted by the first counter, according to the mean luminance, the W/B selector for selecting either the white color or the black color according to the mean luminance, the pulse generator for asserting the

pulse width determined by the ratio calculator at the timing of the counting by the second counter, and the output control circuit for selecting the color information corresponding to the trigger signal or the white color or the black color information responding to the timing signal generated by the pulse generator, thereby enabling the white color or black color information to be inserted and the contrast to be improved.

10. The image display apparatus by a projector defined in claim 6, wherein the RGB trigger generating means comprises a assert timing register capable of freely setting the assert position and an negate timing register capable of freely setting the negate position, whereby the trigger signals can be generated by counting these freely settable registered values and the clocks from the vertical synchronizing signal.

11. The image display apparatus by a projector defined in claim 6, wherein the RGB trigger generation means comprises the assert timing register capable of freely setting the assert position and the pulse width register capable of freely setting the active pulse width, whereby the trigger is asserted by counting the freely settable registered values and the clock from the vertical synchronizing signal, and the trigger signal is negated by counting the number of the clocks registered with the pulse width register and the clocks.

12. The image display apparatus by a projector defined in claim 5 or claim 6, wherein, in outputting the color information corresponding to the trigger, while the voltage outputted from the D/A conversion circuit is under control, the insertion timing of the white color or the black color is controlled, whereby not only the contrast and the purity of the

white color or the black color can be improved but also the purities of other colors can be maintained as high as possible.